UNIVERSITY OF MICHIGAN
MAY 8 1953
EDUCATION LIBRARY

The American Biology Teacher

A service publication of
The National Association of Biology Teachers
teaching the life sciences from elementary grades through college

APRIL
1953

•

Visual Aids

•

Damsel ly Larvae

•

Vol. 15, No. 4

New 1952 Model!

35-mm. EXAKTA "VX"

Single Lens Reflex Camera

One lens both for viewing and picture taking assures perfect sharpness, accurate exposure, maximum depth of field, and correct composition for color. You always see the exact image before you take the picture—whether the subject is an inch or a mile away, whether it is microscopic or gigantic, whether it is moving or stationary. Instantly interchangeable lenses permit telephoto, wide angle, close-up, copy and microscope photography. **With f2.8 Zeiss Tessar "T" Coated Lens with Pre-Set Diaphragm Control ..... $269.50 tax included**

Write Dept. 900 For Free Booklet "I"

NATURE PHOTOGRAPHY WITH THE HIGH-SPEED FLASH by Alfred M. Bailey (Denver Museum of Natural History). This eminent explorer and scientist displays his finest Exakta photographs and others along with explanatory material. 35 full page photographs. 64 pages **50c**

EXAKTA CAMERA CO.

48 W. 29th St. **New York 1, N.Y.**

SIZE AND SURVIVAL:

Which has survived most successfully, the bison or the boll weevil? You know the answer. Smallness often implies adaptability. The cells of a developing organism get smaller as growth proceeds: differentiation, specialization, adaptation.

Because we are a small company, we are adaptable. We can afford to experiment.

Present your problem, whether it be that of supplying a freshman class with conventional material for dissection and demonstration, or one of special research preparation, we will try it!

THE AGERSBORG BIOLOGICAL LABORATORY
Centralia, Illinois

Nyssco Model

"IDEAL FLOWER"

Made of 'Everlasting' Rubber Composition

A newly-developed dissectible model of a typical dicotyledonous flower, showing many special features that have never before been incorporated in a model of this kind. In addition to the usual structures of petals, sepals, anthers, pistil, etc., the following reproductive processes are presented:

(a) Two interchangeable pistils showing three stages of pollination, and two stages of fertilization in the embryo sac.
(b) One anther entire, and three hemisected to show three stages in pollen formation:
  (1) Sporogenous tissue formation
  (2) Spore tetrad formation
  (3) Formation of two pollen chambers with mature pollen grains.

NO other model available shows so many essential and distinctive features. As the originators of biological models made of rubber composition, with years of experience, we guarantee a product unsurpassed for quality of material, workmanship, and scientific accuracy.

PRICE: Fully colored, size 19" x 16½" **$59.50**

Ask for Cat. No. 7J-Biological Models and Charts

EST. NYSSCO PRODUCTS 1919

NEW YORK SCIENTIFIC SUPPLY CO., INC.

28 West 30th Street **General Supplies for Biology and Chemistry** **New York 1, N. Y.**

RAYOSCOPE

The Complete MICROPROJECTOR

An Open Letter To You

We of the RAYOSCOPE feel that because of the fact that some microscope projectors in the past have been rather ineffective it is very essential that you see the RAYOSCOPE in operation. We welcome comparative demonstrations and are usually able to send a representative without obligation on your part.

We carry other micro-projectors and can furnish an instrument to fit even the lowest budget. Include the subject of "Micro-projection" in the program for your Science meetings and ask us to help you. There is no obligation.

PRICES: $50.00, $75.00, $87.50, $98.50, $125.00, $225.00

For more information or free demonstration write to:

RAYOSCOPE
358 N. Sandusky Street
Delaware, Ohio

PHASE FILMS

present the basic, the impressive, the truly significant biological phenomena—the marvelous interrelation of tissue structure and function in living bodies, the beautiful precision of the hereditary mechanism of cells.

Subjects ready: - "Plant Growth and Mutation"; "Cell Division"; "Meiosis".

Now in our fifth year. Write for previews or descriptive literature.

ARTHUR T. BRICE

PHASE FILMS ROSS, CALIFORNIA

THE AMERICAN BIOLOGY TEACHER

Publication of the National Association of Biology Teachers.

Issued monthly during the school year from October to May. Entered as second class matter October 26, 1939, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

Publication Office—111 E. Chestnut St., Lancaster, Pa.

Editor-in-Chief—JOHN BREUKELMAN, State Teachers College, Emporia, Kan.

Assistant Editor-in-Chief — B. BERNARR VANCE, Daniel Kiser High School, Dayton 4, Ohio.

Managing Editor—MURIEL BEUSCHLEIN, 6431 S. Richmond, Chicago 29, Ill.

Subscriptions, renewals, and notices of change of address should be sent to the Secretary-Treasurer, John P. Harrold, 110 E. Hines Ave., Midland, Mich. Correspondence concerning advertising should be sent to the Managing Editor.

The entire Staff List will be found in the March and November issues.

Annual membership, including subscription, $2.50, outside United States, $3.00.

TABLE OF CONTENTS

Participative Visual Aids — Robert L. Gering 93

Burning the Underbrush — Samuel L. Meyer 95

Film Showings at the AAAS — James M. Sanders 97

Key to Diagrams of Immature Eggs of Vertebrate and Invertebrate Animals Appearing in the March Issue ..... H. P. K. Agersborg 100

So This Is an "Air Fern"? — Arthur J. Baker 101

Flightless Birds of New Zealand; Extinct and Near Extinct — Katherine V. W. Palmer 103

Letters 105

Living Damsel Fly Larvae as Supplementary Material for the Study of Insects ..... Charles E. Hadley 107

Books 109

Biology Laboratories 110

Biology In The News 111

THE COVER PICTURE

The cover picture of the young bird was among a group of pictures submitted by Donald S. Lacroix, who has been supplying *The American Biology Teacher* with excellent photos for many years. Technical data are not available, but presumably the picture was taken in the neighborhood of Amherst, Massachusetts.

The American Biology Teacher

Vol. 15 APRIL, 1953 No. 4

Participative Visual Aids

ROBERT L. GERING, Biology Department, Bethel College, North Newton, Kansas

Learning by study must be won;
'twas ne'er entailed from sire to son.—*Gay.*

Learning is an active, not a passive process. The extensive use of visual aids to enhance the active process of learning has been one of the major educational advances of the last decade. Even in visual aids, however, there is a growing tendency toward the adoption of passive attitudes on the part of both the student and the instructor. For the past three years we have been developing a program which attempts to retain the advantages gained through visual aids but necessitating active participation by students and instructors, i.e., a *Participative Visual Aids* program.

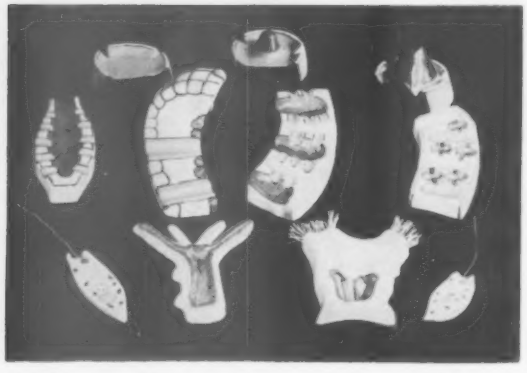
Our program is based on four fundamental premises:

(1) Teaching methods should employ simultaneous involvement of a maximum number of senses. Participative visual aids involve tactile as well as optical and auditory experiences.
(2) Learning is achieved by actively translating new information into terms of one's own experiences.
(3) Everyone possesses a creative instinct, albeit in varying degrees.
(4) Most students have a poorly developed spatial appreciation.

On the basis of these premises we place considerable emphasis on the construction of models in a number of our laboratory courses. These constructions supplement dissections, and in certain areas (e.g., the section on protozoans in invertebrate zoology) have virtually replaced the traditional drawings.

Embryological sequence of frog. These models, including hemisections, are hand-carved.

Italian plastelina (professional modeling clay) has been the most satisfactory medium for our work. One-half pound of clay per student is ample, as it is reused each laboratory period. A scalpel and a manicurist's orange stick are the only tools necessary. After the first few laboratory periods, however, the students usually devise a most diversified and ingenious array of wood and metal modeling tools for their own use.



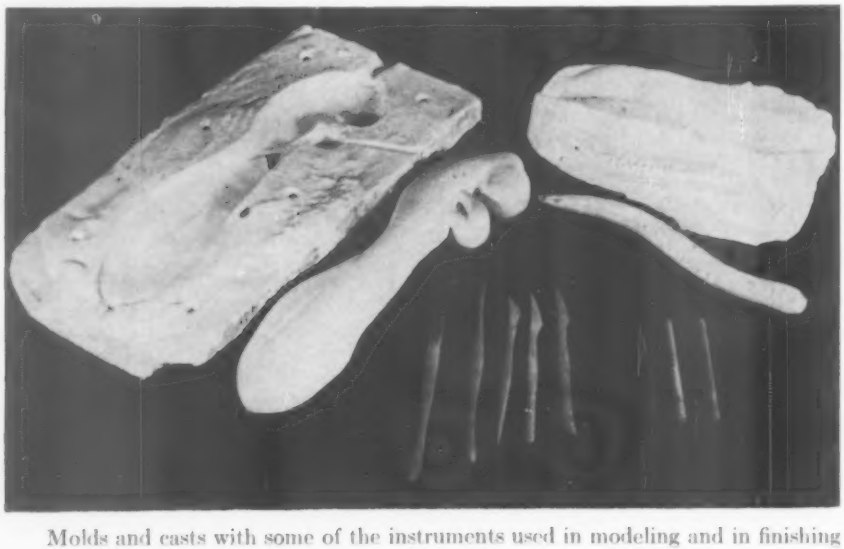
Back row: Subsidence Theory series. Middle row: Schematic models of various sponge types. Front row: Hemisections of Euglena, Hydra and an anemone.

Only the most fundamental instructions are given to the class by way of introduction to modeling but to compensate for these meager instructions we keep close personal supervision of all stages of model construction. In this way, each student rapidly develops his own particular technique. The students are encouraged to inspect all models constructed by the class and to offer constructive criticism freely. Each student is required to make plaster of Paris molds of a few of his models, and subsequently make permanent plaster casts of his molds. The casts are painted with enamel paint, usually in bright colors to facilitate identification of morphological features.

Only the best grade of plastelina should be used. Cheap modeling clay is not uniform in texture or consistency and dries out rapidly. Plaster of Paris may be purchased in bulk for less than 2½ cents per pound. The cheapest enamels available locally in small quantities (4 ounces) have been very satisfactory.

Some use has been made of wax in our model construction. Commercial paraffin is excellent. Scalpels, razor blades, and metal histological section lifters are used for modeling the wax. Old and discarded instruments are used as they must be heated in an open flame. The models are "roughed out" with sharp instruments while the details are added by literally melting the wax into the desired shape with hot metal instruments. The wax models are more difficult to make, especially for the novice, and require more time to complete. We include a limited number of wax models in our program because of their delicate details, which cannot be duplicated as accurately in small clay models, and because of their artistic beauty. The use of plastics in model construction by the students as part of their regular laboratory work has been discouraged because of the time and the cost involved. Where these two factors are not involved, the construction of plastic models should be highly encouraged.

In spite of the fact that none of our students to date has had any previous art training, the results of our program have been most gratifying. Class morale and enthusiasm has



Molds and casts with some of the instruments used in modeling and in finishing the casts.

improved markedly in those courses in which we have used model construction. The students gain a keener appreciation and understanding of the significance of and the correlations existing between morphological structure and physiological function. These fundamental appreciations carry over into other courses in biology. Finally, the students quickly learn to appreciate spatial relationships in uniplanar illustrations especially in their work with monocular microscopes.

A final caution should be added. Participative visual aids should be used *only as a supplement* to the traditional laboratory studies, and *not as a substitute* for them. Intelligent and judicious application of the program is paramount. Participative visual aids are not a panacea for all the problems encountered in a laboratory course. As with laboratory drawings, particular care must be exercised to prevent the mechanics of model construction from becoming an end in itself. Participative visual aids are only a means to an end, namely, a more intelligent and a better integrated appreciation of the biological world.

Burning the Underbrush

SAMUEL L. MEYER, Executive Director, American Institute of Biological Sciences, 2101 Constitution Ave., Washington 25, D. C.

There is an old legend which tells of a general who found his troops confused and disheartened. This critical situation had arisen because the several divisions of the same army were separated from each other by a dense growth of small trees, shrubs, and underbrush. The troops of no division could see those of another. Each unit felt that it was standing alone against the enemy and the potential strength of the army was greatly reduced. Recognizing the problem, the general issued an order: "Burn the underbrush!" It was done and the soldiers saw that they were not isolated units, as they had supposed, but were all a part of one great army. Their courage returned and they moved forward—to victory.

THE AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES is composed of a number of biological societies with varied interests ranging all of the way from bryologists to horticulturists and ichthyologists to mammalogists. They once stood like the divisions of the army, weakened because of their apparent isolation. Now, through the program of the American Institute of Biological Sciences, the underbrush is being burned away and the army of biologists is gaining strength through a common purpose and united action.

The need for such a central agency to unify the biological sciences and to serve biology has long been recognized. However, it was not until relatively recently that an appreciable number of biologists came to recognize that the division of biology into a number of separate groups, each with its own interests and program, was a source of weakness to the profession as a whole. There was no unifying mechanism, no central organization to speak for biology and biologists. It was to fulfill this need that the American Institute of Biological Sciences was organized in 1948 under the auspices of the National Research Council.

The general purpose of the American Institute of Biological Sciences, the AIBS as it is commonly called, is to promote the advancement of the biological sciences and their application to human welfare. Its specific objectives are: (1) to assist biological societies and similar organizations in matters of common concern which can be dealt with most effectively by united action; (2) to promote unity and effectiveness of effort among all who are devoting themselves to the biological sciences by research, by teaching, or by the application of biological data; (3) to foster the relations of the biological sciences to other sciences and to the arts and industries; and (4) to cooperate with local, national, and international biological organizations.

The AIBS is a voluntary association of organizations which have in common an interest in the life sciences. Membership is primarily by societies and similar groups. The constitution provides for three types of group membership; Members, Affiliates and Associates.

Members are non-profit organizations which

have a national field of operation concerned with the advancement of the biological sciences. They pay annual dues calculated on the basis of one dollar for each member who belongs to no other AIBS Member Society and fifty cents for each member who belongs to more than one AIBS Member Society. No society pays an annual assessment of more than $1,000.

Affiliates are local, regional or national non-profit organizations interested in the biological sciences. They pay annual dues of not less than $100.

Associates are commercial concerns, industrial enterprises, and other agencies interested in contributing to the support of the biological sciences through the AIBS. The annual contribution of an Associate is not less than $200.

The present membership of the AIBS includes 17 Member Societies, 6 Affiliate Societies, and 13 Associates. The total membership of the 23 societies is estimated to be about 28,000.

The AIBS is directed by a Governing Board composed of representatives from the Member Societies and the National Research Council. Officers of the Institute are a Chairman, a Vice-Chairman, and Executive Director and a Convention Director. The Chairman and Vice-Chairman are elected from among the members of the Governing Board; the Executive Director and the Convention Director are appointed by the Executive Committee. The Executive Committee is appointed by the Governing Board and meets to carry on such business as is necessary between meetings of the Governing Board.

The current program of the AIBS contains many activities of interest and value to biologists and biology.

The AIBS *Bulletin* is a quarterly publication which serves as a medium of inter-society communication as well as a forum for the discussion of subjects of general interest to biologists. Individuals who belong to Member Societies receive the *Bulletin* as part of their dues; members of Affiliate Societies may subscribe to the *Bulletin* for $1.00 per year. The regular subscription price is $2.00.

The AIBS arranges for national meetings of AIBS societies and other groups who request that service. These meetings are held in the Fall on university campuses. The first such meeting was held at Ohio State University in September, 1950. The second was at the University of Minnesota in 1951 and the third at Cornell University in 1952. The 1953 meeting is to be held at the University of Wisconsin and that of 1954 at the University of Florida.

Certain business office services are provided for member and Affiliate Societies. An addressograph file is maintained at current status. This mailing service is available to Member and Affiliate Societies at a charge of $5.00 per thousand for addressing envelopes. There is no charge for setting up and maintaining the addressograph plates for Member Societies. For Affiliates, there is no charge for setting up the original plates but a small charge is made for corrections and additions.

The AIBS Placement Service offers a liaison service between biologists and prospective employers. Any biologist who is a member in good standing of an AIBS Member Society may register free of charge. Members of Affiliate Societies may register with the payment of a $3.00 annual fee. For all other biologists there is an annual registration fee of $5.00. Registration entitles a biologist to appear on quarterly lists, published by the AIBS, which give his name, home address and a brief resume of his scholastic and professional qualifications.

A Handbook of Biological Data which will give to biologists a set of tables comparable to those now available to chemists and physicists in the fields of non-biological data is now being prepared under the sponsorship of the AIBS. The first fascicle, entitled "Standard Values in Blood" has appeared in book form, published by the W. B. Saunders Company. Other fascicles in the series, which include "Nutrition and Metabolism," "Growth and Reproduction," and "Performances" are in preparation.

A bi-monthly publication, the *Bio-sciences Newsletter*, originates in the AIBS office. It is forwarded to the Committee for International Scientific Publication for translation, publication and distribution by the State Department. The last issue, of which 1,500,000 copies

were published, was sent to French- and Spanish-speaking nations as well as many English-speaking countries abroad. The contents include summaries of biological progress in the United States as reflected by papers and symposia presented at national meetings and research papers published in leading society journals.

The AIBS and the Federation of American Societies for Experimental Biology have been called upon recently to represent the field of biology on the Scientific Manpower Commission. Fields or major disciplines, rather than individual organizations or societies, are to be represented on that important body.

Many other activities are undertaken by the AIBS as a service to biologists. Problems involved in the publication of scientific journals are constantly studied. Opportunities for biologists in commercial and industrial enterprises are being investigated. The preparation of career guidance literature in the biological sciences is under consideration. The AIBS is assisting the American Physiological Society in its study of physiology as a science by compiling information on high school and elementary school textbooks in biology and related areas. The AIBS transmits information relative to international congresses and other meetings held abroad from the Office of Foreign Relations of the National Research Council and from the State Department to the biologists of this country; its representatives speak for biologists in contacts with Selective Service; it is in a position to work with the Office of Scientific Personnel and the National Science Foundation on matters pertaining to biologists; it acts as an operating agency for many of the worthwhile projects of the Division of Biology and Agriculture of the National Research Council.

A few years ago, the American Institute of Biological Sciences was a dream, an idea in the minds of a few biologists. Today, it is an established fact. The idea of a biological institute resulting from the cooperative efforts of many different biological societies has been realized. The underbrush of specialization, divergence, and even rivalry which separated the divisions of the army of biology into futile, defenseless units is being burned away. The united army grows in confidence and esteem. It is a bulwark of strength to American biology. The AIBS is burning the underbrush.

Film Showings at the AAAS

The films reviewed here were shown or programmed for showing at the joint sessions of NABT, NSTA and ANSS at the AAAS meetings in St. Louis, December 27, 29 and 30. The Audio-Visual Committee of NABT expresses its deepest appreciation to the officers of the participating organizations, to the film producers, and to the local arrangements committee. Everywhere, all with whom we had even fleeting relationships were most helpful. To them full credit is due.

JAMES M. SANDERS,
Chicago Teachers College

The following films are available from Almanac Films, Inc., 516 Fifth Avenue, New York 18, at $45 each.

SOW AND SOW. 16 mm sound, black and white, 12 minutes. Deals with methods of seed dispersal; shows some unusual devices which aid in the distribution of seeds.

PROTECTIVE NATURE. 16 mm sound, black and white, 12 minutes. The ways in which wild creatures and plants are defended and how they defend themselves are wonderful and strange, as well as humorous. Some of these are shown.

MIRACLES OF MOSS. 16 mm sound, black and white, 12 minutes. The life cycle of moss is a fascinating story and a series of "miracles." Mosses do not have "flowers," even if the commentator did so state.

DRAGONS AND DAMSELS. 16 mm sound, black and white, 12 minutes. This is an excellent account of the life history of these useful insects. However, there were some errors in the accompanying commentary. A mouth part was called a "lower jaw"; then, apparently, the same structure was called a "lower lip" and an "upper lip." Gills on nymphs or naiads were called "lungs." The expansion of the wings was not explained, and the nymphal exoskeleton or "skin" was referred to as a "shell."

The films and photography were excellent, but the commentary sounded as if ad libbed. Many

pauses were filled in by "uh - ah," and numerous small errors of fact detracted. A well-prepared script would enhance all of these films.

Teaching Films Custodians, Inc., 25 W. 43rd St., New York 36, New York. The following films were all edited and adapted from regular Hollywood features by members of the NSTA Motion Picture Committee, who are to be commended for the excellent job they have done.

YELLOW JACK. 16 mm sound, black and white, 33 minutes. A fairly authentic summary of The Yellow Fever Commission's activities in Cuba during the Spanish American War. The names of members of the Commission and of the soldiers who volunteered for experiments are prominent, and Dr. Carlos Finlay is treated very sympathetically—"I give you 19 years of my life." The whine of the *Stegomyia* females attacking the soldier under his mosquito netting was realistic and terrifying.

MADAME CURIE. 16 mm sound, black and white, 22 minutes. The mysterious rays discovered by Becquerel intrigued the young Polish student of chemistry (who married Pierre Curie), and the discovery of radium followed. The shot of glowing radium in the dark laboratory has the impact of a revelation of the unveiled Holy Grail.

PIONEER OF FLIGHT. 16 mm sound, black and white, 16 minutes. The story of John Montgomery, whose father was Assistant Attorney General of The United States, is more than an account of the early history of gliding in America. It also points up the scientific method. The questions at the end fit into this very logically.

THE FIRST ATOMIC PILE. 16 mm sound, black and white, 17 minutes. This is the tale of that historic event which took place under Stagg Stadium in 1942 when Enrico Fermi and a large crew of worried assistants set up conditions for the first chain reaction, and we entered the atomic age with its promises and its foreboding omens of ill will.

PROGRESS ON TRIAL. 16 mm sound, black and white, 18 minutes. The story of how Dr. McClure of Scotland introduced chloroform anesthesia to the people of the glen is vividly portrayed. He demonstrates chloroform successfully on his dog. Human reactions are clearly illustrated.

These films are not bought or rented in the ordinary sense but are leased for a three-year period.

Scientific Film Company, Dept. C, 6804 Windsor Avenue, Berwyn, Illinois.

THE USE OF THE MICROSCOPE. 16 mm sound, color, 25 minutes, $175. Shows and names parts of microscope, explaining their uses. Covers illumination, sources, and does a step by step examination procedure even to cleaning lenses and suggesting posture, with a long list of precautions. It lives up to its title.

Audio-Visual Aids, Southern Illinois University, Carbondale, Illinois.

THE LIFE CYCLE OF A YEAST CELL. 16 mm sound, black and white, 17 minutes, $85. Shows both budding and sexual reproduction in yeast, methods of single cell isolation with the micro-manipulator, the use of the micro-forge, and methods of culturing and hybridizing pure strains. Isolation of single ascospores is shown.

University of Nebraska, Bureau of Audio-Visual Instruction, Lincoln, Nebraska.

HUNTING ANIMALS OF THE PAST. 16 mm sound, black and white, 22 minutes, $90; also in color, $180. Has a general appeal from high school age upward. It deals with Nebraskan fauna of at least 30 million years ago, and ways of hunting them in quarries and badlands. Tells where skeletons are found and how they got there, how fossilization occurs, carries the hunt for mammals back to the Age of Reptiles, and also shows the manner of handling, transporting, and mounting.

The following films are available from Encyclopedia Britannica Films, Inc., Wilmette, Illinois.

INTRODUCTION TO BIOLOGY. 16 mm sound, black and white, 13 minutes, $60. Definition of principles, divisions, and opportunities for varied interests; also crosses such fields as serology, physiology, various animal phyla and plant types, as well as the physiological relationships between plants and animals.

LIFE ALONG THE WATERWAYS. 16 mm sound, color, 11 minutes, $100. The stream and life changes along the way from headwaters to the sea. Some seasonal changes are also shown. Emphasis on the community relationships of plants and animals, various plant and animal populations, and their habits.

UNDERSTANDING VITAMINS. 16 mm sound, color, 14 minutes, $120. There has long been a need for a teaching film on vitamins. This one covers the historical beginnings, and progresses to vitamins E, K, B_{12}, and to anemia; also refers to anti-vitamins, and the antagonisms between vitamins and sulfa drugs. Suggestions for conserving vitamins

during cooking are a valuable part of the film. An Erlenmeyer flask was miscalled a "beaker."

ANTIBIOTICS. 16 mm sound, color, 14 minutes, $120; also available in black and white, $50. The speaker, who defined antibiotics, had a voice superior to that of the regular commentator. *Cocci*, whenever used, was mispronounced. Excellent shots of experimentation and tests. Antibiotics fight hunger and disease. Specific effects of antibiotics on bacteria not given. Animated drawing of bacterial divisions showed definite nuclei, which is not the case. A mycologist is not concerned with only soil molds as implied. This is a valuable teaching film.

ALLERGIES. 16 mm sound, color, 12 minutes, $100; also available black and white, $50. States types of allergic symptoms, explains effects of histamines and anti-histamines. It also tells the idea of the shock organ or tissue and indicates various types of tests—scratch, injection, patch, and conjunctival—and suggests the belief that tendency to allergies is a Mendelian factor.

THE ATOM AND INDUSTRY. 16 mm sound, black and white, 12 minutes, $50. Shows how radioactive material can be used to tag oil in pipelines, to measure the wear of machines, and in the testing of fuel and explosives. Only a few specific uses were exemplified, but an idea of the wide range of possibilities may be obtained.

THE ATOM AND MEDICINE. 16 mm sound, black and white, 12 minutes, $50. Showed specifically the use of radioactive iodine in identifying and also in treating thyroid disorders. Points out absence of danger to the patient, and the care which anyone who might be constantly exposed to radiation must constantly exercise.

JET PROPULSION. 16 mm sound, color, 12 minutes, $100; also available in black and white, $50. Shows the modern application of Newton's 3rd Law of Motion in turbo-jets, prop-jets, pulse jets, ram jets, and rockets, stating advantages and disadvantages of jet types and uses. An excellent teaching film.

All of these films could be understood by high school students and upward.

The following films are available from International Film Bureau, Inc., 6 North Michigan Ave., Chicago 2, Illinois.

SPRING BLOSSOMS. 16 mm sound, color, 25 minutes, $150. A fantasy of color time-lapse photography of plants that bloom in the spring, from the deep south to those of the Pacific northwest, by John Ott, who very evidently loves to photograph flowers.

MIRACLE OF THE TREES. 16 mm sound, color, 12 minutes, $100. Shows opening of buds and various types of flowers of trees. Commentary brings out facts of pollination and separate sexes of flowers on different trees. One very interesting winter shot anticipated spring. Neither this nor the preceding film are straight classroom teaching films, but they are highly instructive and beautiful.

The Living Science Series includes 16 mm sound, color, short films of approximately 6 minutes each; $50 each.

BIRDS THAT EAT FISH. Includes such birds as herons, kingfisher, osprey, and loon. The questions at the end are provocative.

BIRDS THAT EAT FLESH. Well illustrated by such predators as hawks and owls. Like the other bird films there are good questions at the close.

BIRDS THAT EAT INSECTS. Exemplified by nighthawks and woodpeckers.

BIRDS THAT EAT SEEDS. Sparrows and short strong-beaked birds that benefit us by eating weed seeds.

BUILDING BIRD HOUSES, and ATTRACTING BIRDS IN WINTER, tell their own stories by their titles.

This series attracted much interest at the AAAS meetings.

Bituminous Coal Institute, Southern Building, Washington, D. C.

POWERING AMERICA'S PROGRESS. 16 mm sound, color, 25 minutes, free loan film. This has been rated as the best industrial or non-teaching film of its year. It covers not only the entire story of coal mining, processing, and transportation, but also shows the part coal plays in basic industries and the community. It is a "must" for everyone.

Arthur T. Brice, Ross, California.

PLANT GROWTH AND MUTATION IN TRADESCANTIA VIRGINICA L. 16 mm sound, black and white, 12 minutes, $50. A phase film showing normal mitosis in hair cells from flowers; also the effects of colchicine on mitosis. Chromosome groups can be plainly seen though not counted.

Any items intended for the October issue should be in the editor's hands BEFORE JUNE 1, since the October issue must be made up before his summer vacation.

Key to Diagrams of Immature Eggs of Vertebrate and Invertebrate Animals Appearing in the March Issue:

A. Immature egg of *Asterias forbesi*, the common Atlantic starfish.
B. and B-1. Immature eggs of *Eupomotis*, the common sunfish.
C. Immature egg of *Gallus domesticus*, the common fowl (Leghorn).
D. Immature eggs of *Passer domesticus*, the common sparrow.
E. Immature eggs of *Homo sapiens*, the common man.
F. Immature egg of *Oryctolagus cuniculus*, the domestic rabbit.
G. and G-1. Immature eggs of *Canis familiaris*, the Cocker Spaniel.
H. Immature egg of *Felis silvestris*, the domestic cat.

The smaller cells, surrounding the larger cell (ovum), are nurse cells. The starfish egg (A) also has nurse cells at the beginning of its development.

Comparative histology is without a doubt the most elucidating phase of biology—especially if the student knows something about comparative anatomy, which may be studied simultaneously with comparative histology, or immediately after a year's course in comparative anatomy. Biology has little practical or philosophical meaning unless one learns considerable biological morphology. Biology is NOT the study of a number of plants and animals in the relatively same proportion! Such notions indicate a lack of the grasp of the meaning of biology. The study of an oak in all of its details is truly as real biology as the study of a horse in all of its details! Biology is the study of life. The study or subject of study may be any living organism. Paleontology has been classed as a branch of geology, whether related to plants or animals; so, indeed, may be the study of systematic botany or systematic zoology and morphology when not studied from the standpoint of living entities. Biology is the study of living things, plants or animals or both.

Take, as an example, comparative oogenesis—the coming into being of eggs. What an inspiring study! What an elucidating problem!

The illustrations A–H show a marked similarity in the developing ovum of eight different species. An early stage of the egg of a barn yard sparrow is practically the same or looks very much like the developing ovum of a newly born girl (Figs. D–E). The exactly similar developmental stages shown in the rabbit (F), the dog (G and G-1), and the cat (H) can be found in man. The fish (B and B-1) ovum has its nurse cells, as have the ova of mammals and birds (E–H, and C–D, respectively). What a study! What a revelation! To get and to put across the fuller meaning of this, one should study and illustrate a number of developmental stages of ova of all the metazoa—animals higher than protozoa. A subject worthy of a doctor's thesis! It would be a contribution to biology more useful than one may think.

H. P. K. Agersborg,
Agersborg Biological Laboratory,
Centralia, Illinois

EDITOR'S NOTE: The following paragraphs were inadvertently omitted from the March article on "The Importance of Comparative Histology in Education." Dr. Agersborg also wishes to add that new members may obtain free reprints of the article from him as long as the supply lasts.

Then, in review, make a phylogenetic survey, beginning with volvox; trace phylogenetic morphogenesis, first monoblastic epithelial forms, then diploblastic epithelial forms and the beginning of the triploblasts, and then the more complicated tissues and organs of the mesoderm interposed between the ectoderm and endoderm; finally, witness phylogenetic morphogenesis and dedifferentiation of structures. Supplement this with one of two species for ontogenetic morphogenesis, and the student will not only understand histology but will have a good foundation for the study of specialized human histology and human pathology. He will, too, appreciate comparative anatomy, gross human anatomy, and physiology more intelligently, and organic evolu-

tion will no longer be a bothersome doubtful question.

Comparative histology stands in the center of the great science of zoology, and interprets the meanings of its many branches. Moreover, cytomorphosis and morphogenesis are new lamps to histology and embryology that must be utilized studiously for, without them, pathology is a meaningless smudge.

Comparative histology, inspired by modern cytology and genetics, gives meaning to anatomy, physiology, and pathology. It is inspiring discipline, and is the cornerstone of modern liberal arts and social culture; it gives fresh insight into much that is basic in our culture. Any truly liberal education should include an introduction to this most basic of the biological sciences. It is the real foundation of the healing arts. Premedical and medical students should concentrate on cellular biology since this is the most direct, natural, and least costly approach to many medical problems, those that they must solve as students and those which they will meet as practicing members of their profession.

Comparative histology, based on comparative anatomy, tells much about the nature of man. For this reason, it is a most comprehensive and enlightening discipline. Because of its comprehensiveness, it should begin in high school, and be enlarged upon in the liberal arts and teachers' colleges, and in the universities. Like English, it should be required for all students in intermediate and higher education. The results should be better citizens, parents, teachers, preachers, physicians, better men, and a more perfect society, which is the purpose of education. It should always be borne in mind that nothing can justifiably take the place of knowledge based on truth; no discipline can tell as much about the true nature of man as can modern comparative histology.

So This Is an "Air Fern"?

ARTHUR J. BAKER, Biology Instructor, Crystal Lake Community High School, Crystal Lake, Illinois

"How does that plant take in food?" "I thought all plants had to have water." "Is it really a fern?" "Please tell us what it is." "I have never seen a plant just that color."

A little bunch of frilly green lying on the laboratory table was the genesis of this growing curiosity. John has brought it in. He was most pleased about it. It was an "Air Fern," and we had just been studying Pteridophytes. I displayed it on a table, thinking I had never seen an air plant resembling this one.

After two weeks, the plant looked as refreshingly green as it had the first day, and it was taking longer at the beginning of each period to quiet the persistent questions. My candid remark, "I really don't know," was kindling curiosity. It was now time to act.

The next two days proved to be among the most gratifying of any in my teaching experience. I laid out microscopes, hand lenses, teasing needles, glass slides, cover slips, scissors, beakers, bunsen burners, flasks, test tubes, and a sprig of the mystery plant at each table. My remarks at the beginning of the first period were brief: "Many of you have had questions concerning our 'air fern.' Some of you have asked how it lives without soil or water; some have suggested that it is not a plant at all, but something artificial resembling an air plant. Well, what are we waiting for? Let's find out. The materials are before you."

It took ten minutes that day for my pupils to become convinced that I meant what I said. This period was marked with a hesitant, "May I really use the microscope, sir?" Or, "Did you lay these hand lenses out for our use?" All questions received an affirmative nod, followed by a short period keynoted with questions on the best approach to the experiment. I assured them that it was entirely up to them.

Now the room was bursting with feverish activity. Books were taken from the shelves; they were grouping themselves into two's and

Larry and Dick, with the display of their work which received FIRST rating in the Illinois Junior Academy of Science District and State Contests.

three's and getting a real foothold on the task before them.

The last five minutes of this first period were turned over to any pupils who wished to report on findings. Those who had worked with the microscopes reported that they were convinced it was a real plant. Dick presented the most startling revelation when he announced that the green coloring of the plant was readily dissolved in water, and followed that by dramatically reading from a book that chlorophyll is non-soluble in water. He was of the opinion that the plant was dyed.

Dick and Larry, who had teamed up, asked if it would be possible to make sections of the stem to compare the structure with that of a true fern. I gave them a book on microtechnique. Several pupils were interested in methods of analyzing gases given off by the plant, and these too were referred to adequate sources.

A summary at the end of the second day illustrates the productive ability of adolescent enthusiasm. Dick and Larry were gathering the necessary materials for the proper embedding and sectioning of the plant. Two other boys had set up apparatus to measure and analyze gases given off by the plant. Iodine tests for the presence of starch had been carried on. One section of the plant had all light shut off from it for the purpose of determining the relationship of its color to the possible presence of chlorophyll.

In the opinion of their instructor, this type of procedure could not have been successfully extended beyond two days. There were several in each class who had reached their limit of individual investigation, yet several in all classes were spending their free periods in the laboratory and working after school in an effort to discover more facts about the "air fern."

Dick and Larry had been at it six weeks now and had not finished yet. They had proven that the green coloring matter is something other than chlorophyll, and had taken samples of it to chemist friends in an effort to find out just what the dye is. They had successfully embedded tissue. Before sections could be made, it was necessary for them to repair an old microtome. The subsequent microscope slides showed no relationship to real ferns. Considerable library work, in an attempt to classify the "air fern," proved unsuccessful. In the end a college professor assisted us. The air fern is in reality a Bryozoan—a simple marine animal.

These two boys had shown real innate ability since the beginning of the school year and, therefore, had been encouraged to enter the Biology Club where it was possible for them to give a fuller expression to their abilities in the form of research projects. These projects would later be entered in competition at district and state science contests sponsored by the Illinois Junior Academy of Science. Both boys had been very hesitant when I mentioned this possibility to them.

It took the "air fern" to set them afire. They were now begging me for the opportunity to organize their materials in such a way that they could enter it in the district science contest.

The success of their project in the district and state science contests is a real tribute to their interest and enthusiasm. They received 1st Division Ranking in each.

This experience has illustrated to me that the average secondary school pupil has the ability to apply the scientific method to new

circumstances. Properly motivated, he has the necessary inquisitiveness and patience to carry on original investigation. The classes learned about photosynthesis, how to collect and analyze gases, the effect of light on the plant, and starch tests and how to manipulate them and what meaning they have to plant development. They learned that everything green is not chlorophyll, that everything called a "fern" is not a fern, that everything that looks alive is not alive, that everything that looks artificial is not artificial, and that some things that look like plants are really animals. For two days our classes successfully carried on original investigation. On no day in the whole school year did they seem as happy and contented as when they were doing original, productive, unassigned work.

Their attitude toward advertising, and what a thing is and why a thing is what it is, is greatly changed. Can't you see Dick coming into my room this morning, picking up a sprig of the plant that is lying on my desk, raising one eyebrow quizzically, giving me a broad wink, and saying, "So *this* is an air fern?"

Flightless Birds of New Zealand; Extinct and Near Extinct*

KATHERINE V. W. PALMER, Paleontological Research Institution, Ithaca, New York

If one were asked where there could be found the remains of enormous extinct flightless birds, the answer would be New Zealand. If asked where one could find a small flightless, ostrich-like bird, the answer would be New Zealand, and if asked where there is a flightless bird which was thought to be extinct but rediscovered, the answer would still be New Zealand.

New Zealand is that three-main-island Dominion, the size of the Atlantic Coastal states of Rhode Island, Pennsylvania, Maryland and Delaware; by sea 1200 miles east of Australia, 6000 miles west of South America, and 1100 miles south of the Fiji Islands.

Thus it is surrounded by water. But for man it would be isolated today, as it has been for about 70 million years since the Cretaceous period. Consequently, because of this long separation, New Zealand was and is unique in the lack of native ground mammals combined with the presence of flightless birds. Of the latter there were a large woodhen (a rail) (*Aptornis*), a goose (*Cnemiornis*), another rail, the takahe (*Notornis*) and the ostrich-like birds, the kiwi (*Apteryx*) and the moas. The moas were the goliaths. These, with the flightless goose and giant woodhen were extinct before the white man (pakahe) took over in New Zealand. The smallest of the group was the kiwi. It, as well as the takahe, survived the trespassing of man into their domain.

The ancestry of the moas and kiwis goes back two to eight million years. Fossil bones of both have been found beneath the lava flow of an extinct volcano. The lava flow in turn lies below clay silt deposits of extensive glaciers of former days. Thousands of years ago, great numbers of moas lived in both islands from the mountains to the sea. Though the legends of the native people, the Maoris, tell of a fierce monster—"bird or person—which dwelt in a cavern on a precipitous side of a mountain," no Maori ever saw a living moa. Representatives of one of the families of the moas were known to the pre-Maoris or earliest moa hunters. Those birds were not of the height of the earlier giants but about as large as the present day emu of Australia. Moa bones by the thousands have been found and represent birds from four to twelve feet high.

There were six or seven genera of moas with from one to six species in the genera. The largest moa, *Dinornis maximus*, adult stood from 10 to 12 feet tall, and the smallest forms 4½ to 5½ feet. Today ostrich-like flightless birds are the ostriches of Arabia to South Africa, about 7–8 feet high, the emus of Australia, about 7 feet, the cassowaries of Australia and the Papuan islands, about 5 feet,

*Read before National Association of Biology Teachers, AAAS, December 29, 1952, St. Louis, Mo.

the rheas of South America, about 4–4½ feet, and the pygmies of the lot, the kiwis of New Zealand, about the size of a leghorn. Besides the short and rudimentary wings, the keel-less breastbone, the bones of these birds are less pneumatic than those of the birds of flight.

The knowledge and discovery of moa bones are not only of modern times. A single bone, a femur with ends broken, was caried to England in 1839 to the great anatomist, Sir Richard Owen. From that bone, Owen deduced that it belonged to a gigantic bird which could not fly. Great discoveries and excavations followed in 1868–70; thousands of bones with some complete skeletons were gathered. With these novelties of museum wares exchanges were set up with museums throughout the world, particularly with that master of his trade, Henry A. Ward, the originator of Ward's Natural History Establishment.

From across the seas, stuffed animals and relics reached New Zealand and from there moa bones were distributed to Europe and America until in the late 1870's, moa bones became a drug on the museum market. In 1895 an excavation revealed what was calculated to have been the remains of 800 birds in a pit $30 \times 20 \times 10$ feet.

Not only bones have been found but also feathers, eggs, gizzard stones and associated remains of plants and other animals. A mass of literature has been written with conflicting ideas as to the details of skeletal restoration, mode of life of the species, and what caused their extinction.

An accidental find in a swamp in 1939 led subsequently in 1939–41, 1942, and 1948, to the careful systematic and scientific excavation, collection and study of that swamp area of about three and a half acres. From that spot so far, accumulated specimens of four genera of moas have been found, including 17 more or less complete skeletons of the largest and 27 of the smallest with a total of 50 more or less complete skeletons and representative bones of 140 animals in all. Associated with the moas in this deathtrap were found the large flightless woodhen, *Aptornis*, which stood 2½ feet to 3 feet high, flightless goose, ducks, an extinct swan, a great eagle, takahe, kiwis, the kakapo (a flightless parrot), and bones of the *Sphenodon* or tuatara, the lizard-like animal peculiar to New Zealand.

Critical analysis of the strong mandible and beak of the moa points to the fact that the animals were grazers and browsers, that through periods of drying up of grasslands and forests, the birds would graze in the damper margins and eventually be bogged in the swamp. This theory is evidenced by the fact that many leg bones were found in an upright position. Concentrations in clefts and caves may have been washed in. The older and popular theory that the moas were exterminated by fires of the Maoris when burning the bush is now disproved. This 1939 discovery at Pyramid Valley has shown that all but one (possibly two) moas were gone probably thousands of years before the "Moa hunters" reached the shores of New Zealand.

In contrast to the size of the extinct moas is that of the living kiwis. These queer looking creatures with no tails, stubs of wings, feathers like hair, beaks 2 to 8 inches long with nostrils at the ends, are nocturnal but have poor eyesight, keen smell and hearing, and lay eggs one-fourth to one-fifth the size of the bird. The sexual behavior of the kiwi is unusual. To begin with, the enormous egg for the size of the bird makes it unique. The egg is laid on the ground in a slight cavity or deeper burrow. The male sits on the egg during the whole period of incubation. Usually one, but two eggs and sometimes three, may be laid and in each case the male, after the egg is laid in the nest, places them in a row lengthwise of himself. It takes an average of 75 days for the egg to hatch; during that time the male has the entire care of the egg and nest. After the hatching, the female takes over. The name *kiwi* comes from the sound the birds make in calling. Night birds, they do not cry in the day. The call, shrill in the male and hoarser in the female, has been heard over a mile. They call mostly during the mating season. Remarkable also is the keen sense of hearing and smell of the birds. By this means, they locate their favorite food, worms, their enemies and members of their clan.

There are four species, and large numbers

of these unique and famous birds abounded in the early days in the wooded areas of the country. The birds were hunted by the Maoris for mats, capes, muffs and meat and the eggs for food. It has been reported that in the time of 1870 one hunter had killed 2200 of two species. With the extensive clearing of the bush for domestic animals, the kiwi became doomed except in established preserves. Even there they are threatened by the introduction of stoats and weasels. Although the kiwi is the national emblem, few New Zealanders today have encountered this creature in the wild or have ever seen one. Through the efforts of one man, Mr. F. D. Robson of Napier, North Island, the birds may be seen and studied in captivity. National law has placed the bird on the protected list. The kiwi, as old in its lineage as the moa, however, has evaded extinction and we hope by protection may again claim its heritage in its native haunts.

Spectacular as the story of the moa and more than that of the kiwi, is that of the takahe (*Notornis*), the flightless rail of New Zealand. This is the bird concerning which a New Zealand legislator, when arguing for its protection, gravely demanded, "we must make it so this extinct bird will never become extinct again."

This bird, which lived with the moa and kiwi thousands of years ago, was first described from bones in 1848. The early Maoris were acquainted with the creatures, but in the time following only four specimens were preserved. Only one of those mounted animals was kept in the homeland. The others were sent to Europe. The species was gradually relegated to the list of extinct creatures.

The takahe is somewhat larger than the kiwi and is big-footed as that bird. It has a strong, large, orange-red bill and brilliant blue indigo and greenish coat of feathers. White man's advent, bringing with it dogs, cats, pigs, weasels and stoats, meant the knell of flightless birds. The takahe was driven into the high damp inaccessible bush of the mountains of the South Island. There it has survived, although listed in the catalog of extinct birds by the world at large along with the moas, the Dodo and *Aepyornis* of Madagascar. A certain amateur naturalist of New Zealand held the belief that the takahe could still exist in the wooded wilds of the high mountains of southern New Zealand. The presence of this bird was rediscovered in 1948–49 through his ferreting around an unrecorded lake and valley of that region. Following the original find, naturalists and trained ornithologists of New Zealand captured birds, found nests and young, took pictures and made abundant notes as to the habitat and character of the bird. The scientists estimated that the area may have harbored 50 to 100 specimens. Following this spectacular news, through concerted efforts of naturalists and officials a 400,000 acre sanctuary has been proclaimed by the New Zealand government, so that this truly beautiful rare bird will "not become extinct again."

Letters

Mr. Breukelman:

. . . I like your magazine very much, especially the "Old Fossil."

Very truly yours,

J. H. Shull,
210 W. Jefferson,
Columbia City, Indiana

. . . I like it immensely. Reading the last issue from cover to cover I found it all valuable and of great interest. It is a privilege to be represented on its advertising pages.

Frederick Haven Pratt, *Vice Pres.,*
The Harvard Apparatus Co., Inc.,
Dover, Massachusetts

Dear Mrs. Beuschlein:

I have enjoyed reading the October issue of *The American Biology Teacher*, and I should have written to you several weeks ago. I wish to offer you my belated but very sincere congratulations. You have made many worth-while improvements.

And many thanks for the "plug" on page 152.

Sincerely yours,

Blair Coursen, *President,*
General Biological Supply House

Dear Mrs. Beuschlein:

. . . We have also received our copy of "The American Biology Teacher" and wish to say we

are very pleased with the improvement and nice printing. However, if we were in your shoes, we would advertise your publication with the people who are interested in the same type of activities. There are more persons interested than you may possibly guess. We feel you shouldn't be restricted to the members of your association. Of course, you will have to make the contents richer in text, but we have no doubt about the fact that your members would be happy to participate; and there would definitely *not* be a shortage of interesting material. Perhaps our suggestion will start something developing.

Please let us know when your next issue is to appear, as we would like to repeat the ad.

With best regards always, we are,

Very truly yours,

EXAKTA CAMERA COMPANY,
46 West 29th Street,
New York 1, N. Y.

. . . I think that the magazine is of the utmost interest. Particularly in this last semester, has this been true, while I have been preparing a course in nature study for elementary teachers. I've never taught in a public school, myself, and so many of your articles that would not be quite so interesting are attracting my attention now. I do think the articles are well written, and the general lay-out is well done.

Sincerely,

ALLEN L. LAKE,
Lees Junior College,
Jackson, Kentucky

Dear Dr. Breukelman:

The December issue was very pleasing in form and appearance. I like the narrow margins . . . .

. . . I find that I have rather strong feelings about the proposal for the NABT to join with the larger national group. I think that Scientists who scorn High School Science teachers have a well grounded objection. It is we who can change this attitude only by becoming more scientific in our approach to our subject, to become more exact and more critical in our thinking and in our accomplishments in the classroom. I believe we could accomplish this in three ways: 1. By a critical evaluation of our professional achievements in terms of Science and research; 2. by providing opportunities for science teachers to work in Research Laboratories during summer vacations instead of constantly going to school and studying *about* Science. DO RESEARCH IN SCIENCE, not read about it. 3. Get outstanding scientists to contribute articles to our Journal . . . .

Yours sincerely,

ENID A. LARSON,
Carmel-By-The-Sea,
California

Mr. Richard F. Thaw,
Corvallis High School
Corvallis, Oregon

Dear Mr. Thaw:

I have just finished reading your very excellent account in *The American Biology Teacher* of the project entitled BIOLOGY II: BIOLOGY ALVENTURE HOUR.

You have indeed done a good job with your students in terms of indoctrination with the spirit of independent investigation, scientific method, and social integration.

If I had known of this a few months ago I should most certainly have drawn specific attention to it in my forthcoming text on secondary methods: *Secondary Science Education* (McGraw-Hill, 1952), and will do so at the first opportunity for additions in the second printing.

Your use of local materials and local references such as Gilkey, and doubtless you also make use of Elmo Stevenson's *Key to the Nests of Pacific Coast Birds*, developed at Oregon State, Corvallis, is to be commended.

Please accept congratulations on your progressive, dynamic attitude toward your field. Biology can use many more like you, sir.

Cordially,

HARRINGTON WELLS,
Santa Barbara College
California

REWARD!

Managing Editor Beuschlein offers a free 1953 or renewal NABT membership to that teacher or student who submits the most suitable name or heading for the Classified Advertising column. Send all entries directly to the Managing Editor.

Remind yourselves also that copies of current issues of this Journal may be obtained at the reduced rate of 15¢ per copy in quantities for use by student and in-service teachers, or for use in science teaching methods classes.

Living Damsel Fly Larvae as Supplementary Material for the Study of Insects

CHARLES E. HADLEY, Professor of Biology, State Teachers College, Montclair, New Jersey

Although a study of insects is admittedly of outstanding importance as a unit of the high school course in biology, the laboratory approach to this subject is often confined to an evaluation of the external features of a single example such as the grasshopper. Moreover, even this limited illustrative material usually involves preserved specimens only.

A proper appreciation of the amazing adaptations of insects, and the consequent success which insects enjoy as competitors of mankind, cannot be attained through the use of such limited material. Field studies of living insects could add much to the student's understanding and appreciation of the fitness of insects to survive and compete with man. But such field studies are impractical for many high school biology classes for a number of reasons.

In lieu of other materials to supplement the student's experience with the insect type, the author recommends the use of living damsel fly nymphs. There follows a brief outline descriptive of the method of collection and the study of these nymphs and of important features of structure and physiology which they clearly illustrate.

Source and Method of Collection

Many fresh-water ponds are used by adult female damsel flies as breeding grounds for their larvae. After hatching, the nymphs may be found clinging to aquatic plants, fallen tree leaves, decaying woody stems, and stones. Because some species of damsel flies require a two-year span for metamorphosis to adulthood, the nymphs may be found in ponds during every month of the year. They can be easily obtained by the collection of a mass of the vegetation to which they cling. In the laboratory, the nymphs should be separated from the vegetation and transferred to shallow dishes of pond water for storage. For a reasonable length of time in storage, the nymphs require no food, especially at lower temperatures; but they do have an unfortunate tendency to bite away each other's caudal gills. This tendency may be frustrated in large measure by allowing them to cling to aquatic plants such as Elodea which should be added to the culture dish.

Methods of Handling and Study

A. *Mounting for Study:* Add a large drop of pond water to a clean microscope slide. Slip either a section lifter or a scalpel blade under the larva and lift it gently from the culture dish onto the slide, using a dissecting needle to nudge the animal from lifter to slide. Add a cover glass gently and add enough additional water to level the cover glass. In this position, the larva may be studied for an hour or more without injury to the animal and undamaged nymphs may be recovered for use in other class sections. Depending on the viewpoint desired, the larvae may be mounted either dorsal side up or ventral side up.

B. *Methods of Study:* The nymphs to be studied should be selected from culture for light pigmentation and cleanliness of their exoskeletons.

1. *Orientation:* A majority of the high lights of structure of the nymphs are best observed from dorsal aspect. The ventral aspect, however, shows clearly several features mentioned later in this outline.

2. *Magnification:* While the gross structure and behavior of the animal may be observed under a hand lens, a 30-mm. objective, or under a wide-field binocular microscope, microscopic details of structure and physiology show more clearly under a 16-mm. objective used with a $\times 10$ ocular.

3. *Light and Focus:* Sufficient illumination and careful focus are essential for observation of details of circulation and muscle structure.

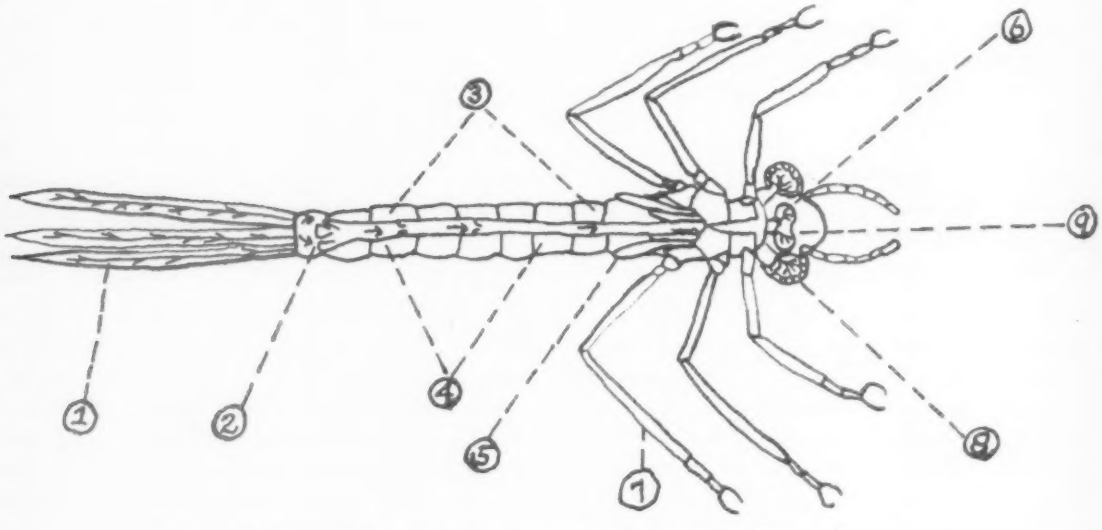
C. *Fundamentals of Morphology and Physiology:*

1. *Capture and Ingestion of Food:* If

small crustaceans, e.g., Daphnia, are introduced into a finger bowl containing hungry damsel fly larvae, the method of capture and ingestion of the food may be observed in some detail. The larva bends its flexible neck joint to focus a compound eye on the crustacean, slowly stalks its prey, and then suddenly lashes out with its folding type of labium, characteristic of these larvae, to effect the capture. Then the victim is held and manipulated by a pair of mouth parts (presumably maxillipeds or labial palps) so that the shorter, dark-tipped mandibles are given opportunity to tear the softer viscera loose from the crustacean's exoskeleton and push this soft food material on into the alimentary canal. The mandibles do not ordinarily protrude beyond the anterior border of the head but they are clearly visible through the translucent head itself. Peristaltic action may be seen to move the ingested food back through the intestine of the larva.

2. *Open Type of Circulatory System:* The elongated, dorsally located heart which extends almost the entire length of the body axis is clearly visible only in the abdominal region. The posterior end of the heart, located at the posterior border of the next to the last abdominal segment, is marked by a pair of ostia (2) through which blood enters the heart. One-way valves guarding these ostia open to admit blood, the flow of which is indicated by the movement of its colorless corpuscles. As the heart walls contract to pump blood anteriorly, these valves close to prevent escape of blood through the ostia. Several other one-way valves can be located within the heart itself. In the head region (9), the blood is seen escaping from the anterior end of the heart into free circulation posteriorly among the viscera. Blood flow can be traced posteriorly by movement of corpuscles seen along the sides of the body (3).

3. *The Respiratory System:* This system lies clearly outlined in black as though drawn with India ink. The tracheal respiratory system typical of insects shows major longitudinal vessels, segmental branches, and major branches to important organs. The finer tracheae branch in proportion to the rate of metabolism as is clearly shown by the abundance of finer branches surrounding the cerebral ganglia (6) (dorsal view) and surrounding also the segmental ganglia (ventral view). The tracheae are prominent also in



Sketch of damsel fly larva, indicating some of the easily observed structures.

1. Tracheal gills.
2. Posterior end of the heart (heart ostia and valves).
3. Region showing open blood circulation.
4. Position of fat bodies.
5. Wing bud.
6. Cerebral ganglion.
7. Leg segment (showing striated muscle).
8. Compound eye.
9. Anterior end of the heart.

the three tracheal gills at the posterior end of the body (1).

4. *The Fat Bodies:* These organs, so well developed and characteristic of insects, are prominent and unmistakable in paired position along the two sides of the longitudinal body axis lateral to the heart (4).

5. *The Compound Eyes:* The many-faceted compound eyes (8) are typical of specialized insects.

6. *The Wing Buds:* Two pairs of wing buds (5) typical of the larval stages in direct metamorphosis.

7. *Striated Muscles:* With proper light and focus, cross striations of leg musculature are clearly visible (7).

Wherever used in high school and college classes, the living damsel fly nymph has met with an enthusiastic reception by students and instructors alike. The added appreciation of the insect type implemented by the use of this material pays a rich dividend for the time and effort involved in the collection and handling of the material.

Books

MAYOR, JAMES WATT. *General Biology.* 4th ed. The Macmillan Company, New York. xii + 875 pp. illus. 1952. $5.75.

The new edition follows the same general plan of organization as that of previous editions. There has been some rearrangement of certain chapters, and others have been rewritten to bring them up to date. The chapter dealing with *chemical principles* has been moved from Part I to the Appendix. The chapter pertaining to the *cell* has been rewritten. The treatment of photosynthesis has been improved. The discussions on *viruses* and *antibiotics* are timely.

In Part III, the significance of *parasitism* is emphasized. The treatment of the "human side" of insects has been extended. To the Anthropod *mind* has been added a discussion on the *language* of the bees—an account of the work of Von Frisch on the behavior of bees.

In Part IV, there is presented considerable tabular material on vitamins, enzymes, and hormones. The metabolism of carbohydrates, fat, and proteins is adequately treated. Here, as in other sections of the book, the practical side of biology is emphasized. In Part V, Professor Mavor presents a more adequate treatment of the physical basis of heredity, Mendelian principles, linkage, crossing over, mutations, and chromosomal aberrations than most elementary textbooks in biology. The writer would have appreciated a discussion by Professor Mavor on the action of genes.

The appendix consists of three parts: 1. A synoptic table of the plant and animal kingdoms. Etymology and pronunciation of the scientific names together with brief characteristics and examples are given. 2. References and background material in chemistry as a basis for understanding biology, and 3. A glossary of biological terms. There are fifteen pages of definitions, etymology and pronunciations of biological terms. An extensive list of commonly used prefixes, suffixes, and combining word forms are included.

There are several new illustrations in the fourth edition, and the book is of a more attractive format than previous editions. The book continues to be a compendium of biological facts, and is an extensive source book of practical information for students of biology.

The manual has been revised to conform to the new fourth edition of *General Biology*. It consists of thirty units. To the thirty-six diagrammatic figures have been added several full-page halftone plates which improve the appearance and usefulness of the manual. Materials required for the various laboratory units and a list of sources of biology equipment and materials are given. The manual consists of 333 pages. It is priced at $3.50.

J, A. TRENT,
Oklahoma Baptist University, Shawnee, Oklahoma

ROYLE, HOWARD A. *Laboratory Exercises in Genetics.* Burgess Publishing Company, Minneapolis. iv + 53 pp. Paper, spiral binding. 1950. $1.50.

This is a concisely written guide for the laboratory part of an introductory course in genetics. It is adapted for use with any modern textbook of genetics. The exercises listed are more than ample for the usual semester's course, thus permitting some choice. There are three parts:

I. Mitosis, meiosis, life cycles of spermatophytes, and early development of animals.

II. Drosophila: its description, culturing, and experimental breeding (7 exercises on the last).

III. Human heredity: taste test, blood groups, and blood types.

Among several appendices there is one on the application of the Chi Square test, with a reproduction of Fisher's table.

The book is attractively lithographed on paper

of good quality. The pages measure 5⅛″×8⅜″. Instructors planning a laboratory course in genetics will wish to examine this manual.

Edward C. Colin,
Chicago Teachers College,
Chicago, Illinois

Vinal, William G. *The Outdoor Schoolroom for Outdoor Living.* Published by the author, R. F. D. Vinehall, Cohasset, Massachusetts. 70 pp. 1952. $1.00.

This interesting and different little book by "Cap'n Bill" Vinal brings together an amazing amount of information, activity material and philosophy. The author is not only a professor of Nature Education at Boston University, a widely known lecturer and consultant in nature work, but also the director of the Boston University Workshop in Outdoor Education. He develops the thesis that wherever interested teachers and students gather "in the fields, in the woods, by the water, there is the school." In line with this thesis, there are presented such things as a lengthy list of projects for outdoor schoolrooms, making a base map, a testing hike, and a plan for neighborhood cooperation. There is unfortunately neither a table of contents nor an index, a rather serious handicap in view of the stimulating contents of the book.

NEW SCIENCE FILMS
16mm sound films for elementary grades
LIVING SCIENCE SERIES NO. 1
(6 min. ea. color $60. Series $100)
ATTRACTING BIRDS IN WINTER
BUILDING BIRDHOUSES
LIVING SCIENCE SERIES NO. 2
(6 min. ea. color $60. Series $198)
BIRDS THAT EAT FISH
BIRDS THAT EAT FLESH
BIRDS THAT EAT INSECTS
BIRDS THAT EAT SEEDS
BIOLOGY FILMS
Other Biology films available for junior high and up including John Nash Ott's color series, in time-lapse photography on the growth of flowers and trees.
Write Dept. BF for new catalog.
INTERNATIONAL FILM BUREAU, INC.
57 E. Jackson Blvd., Chicago 4

Biology Laboratories

By "The Old Fossil"

At Wells High, Chicago

Chicago Herpetological Club had "The Old Fossil" as their speaker for a recent meeting. His subject was "Interesting Facts About the Lower Terrestrial Vertebrates." This included two written articles of his one titled: "Thirteen Snake Superstitutions—True If" and another "Reptile Facts." TOF found out that his presence was desired not so much for the dissertation on reptiles as it was to serve as a moderator to aid them in determining the feasibility of a field trip for the search of reptiles. TOF, having been president of the Chicago Biology Round Table a few years ago, sponsored a few trips; one involved several hundred people. He took his cue and found that a reptile trip should be conducted at night.

In case you have any ideas on field trips send them in and I will pass the information on to their sponsor. If you desire a copy of either of the articles mentioned I might be able to find you one and send it to you.

Reptiles as pets seemed to be common among the members. Most of them maintain specimens in their homes. One boy from a south side high school was describing his pet rattlesnake to me. This was about three feet long. Another boy interrupted the first to describe his pet rattler. His made a pygmy out of the first. The second boy's comment—"and I was looking in his mouth this week and I could not see, . . . could you tell me about that?" "What reptiles do you maintain?" "Where do you collect?" Gosh!

Flower pots of the ordinary red clay variety come in sizes up to twelve inches inside diameter. The smaller sizes have half inch gradations; the larger pots increase one inch to the next size. The outside diameter and the height are equal. There is a shallow type known as a "pan." The pans are two-thirds the height of the ordinary pot. They are used for potting azaleas and similar plants. These are called "azalea pans." "Bulb pans" are one-half the depth of the ordinary pot. These are used for ferns and bulbs. There is also the clay saucer. Both pans and saucers are made of the red baked clay as is our original pot. We are using some of the twelve-inch pots to suspend from the ceiling of the greenhouse with ferns in them. A circle of number nine wire fitted under the collar of the pot has three suspension wires attached to it. This serves as a cradle for the arrangement.

THE JOHN G. SHEDD AQUARIUM is the largest and finest equipped in the world. About two hundred and fifty species of fish are shown. Invertebrates, reptiles, amphibians, mammals and birds also have a place in the exhibits of the aquatics. The fish are from every continent and both the Atlantic and Pacific Oceans. These are exhibited in one forty-foot pool, and six galleries containing 132 exhibition tanks. The balanced aquarium room contains seven large aquariums and sixty-five smaller ones (from CPS Curriculum Bulletin V. 3, N. 17, Dr. Paul R. Pierce, Asst. Superintendent). Any visiting biologists should include a Shedd Aquarium visit on his tour agenda for Chicago.

CARTOON. The strip *Mark Trail* is one of the best color cartoons found in your Sunday newspaper. Are you fortunate enough to have this Post-Hall Syndicate featured in your funnies? They are portraits of nature.

MAKERS OF THE USA is the title of a color chart suitable for your bulletin board. Write Friendship Press, 156 Fifth Avenue for information. They are located in New York City.

OPTICAL PARTS is the title of a catalogue listing lenses, prisms and reflectors for optical instruments. This is published by one of the leading optical firms in the United States.

ALGAE VOL. II. is the tooled gold impression on the back of the leather bound book which was handed to me. It is approximately four and a quarter by six and three-quarter inches with approximately seventy pages. It is apparently hand made without a single stick of type. On the inside fly leaf is printed in pencil "MADE FOR MY GRAND-( )ATHER WHO WAS G( )ARDING PRISONERS ON TORATU(G?)US ISLAND DURING THE CIVIL WAR H(erasuer perhaps) (L PORT)ER. On the sixth page is written, H. W. Mitchell, in longhand similar to the writing of TOF's father who died in 1902 just four years out of Barnes Medical College (now Washington Medical College), St. Louis. He however had nothing to do with this book. The right page of each spread has a form of algae impressed into it. Each appears to be different. At the base of each is a hand painted or drawn design. Some are formal urns, scenes, just simple designs, and one has a couple of penciled figures about a tent camp. The sample of algae run to shades of red and brownish yellows.

BOWSTRING HEMP, or Sansevieria, or mother-in-law tongue, can be started by placing a leaf in a jar of water and permitting roots to grow on its tip. This takes several weeks, but is effective.

HABITAT. Nearly twenty years ago I removed a building down to a stone foundation. Recently I decided to fashion the two or three thousand cubic feet of native hewn stone into a ranch-type house on the acre of ground on the most beautiful spot between Indianapolis and South Bend. Mother, who is afraid of snakes, saw a small garden variety (the first I have noticed in the vicinity) crawl under a beautiful piece of granite, dark blue in color, forty-two inches by eight by ten. To quiet her fears I assumed a prone position to peer under the stone. No reptile was in sight. I remembered reading in a herpetology that stony ledges were their favorite haunts. So a prypole was used and out he came. That was the last one we saw in the area. How he concealed himself I do not know.

A GENEALOGY STUDY was made by one of the first families. They just published their turn-of-the-half century edition. It is a report of over eighty-two hundred descendants from one couple. He was born in Europe in 1700, came to this country and settled in Pennsylvania in 1732. He purchased several tracts of land from William Penn. This man with the given name of Johannen died later, leaving an estate of approximately forty thousand dollars and progeny of nine children. The descendants came from these nine children. The book makes an excellent reference for your study of heredity. It also serves as an incentive to the student to study his own family history. This is not a difficult task provided he uses a few postcards to write to individuals for information. (TOF spells his name Lichtenwalter which is one of the variations from the original Lichtenwalner, the genealogy study in question.)

SEVERAL INQUIRIES were received regarding the Principles of Biology, the hand microtomes, and Trypanosomes. The latter two items have not yet been sold but are good buys. D. Duff of Youngstown was the most recent one to inquire about the principles. Send your suggestions and inquiries regarding these or other problems to "The Old Fossil" at 5061 North Saint Louis Avenue, Chicago 25.

Biology In The News

Toothy Killers of the Swamps by Neil M. Clark, *Sat. Ev. Post*, Jan. 31, 1953, pp. 36–37 & 58–61.

Alligators are necessary members of Southern Swamp communities. Their habits and uses and

IN THE MARKET

Teaching Aids
Audio-Visual Aids
Books and Supplies
Equipment

MARINE BIOLOGICAL LABORATORY
Complete stock of living and preserved materials for Zoology, Botany, and Embryology including Protozoan cultures, Drosophila cultures and Microscope slides.
Catalogues on request
Address Supply Department
MARINE BIOLOGICAL LABORATORY
WOODS HOLE, MASS.

THINGS ALIVE
Protozoa, Hydra, Planaria & Daphnia; also Preserved and Embalmed Biological Materials.
CONNECTICUT VALLEY SUPPLY CO.
89 Kent Road
Springfield 8, Massachusetts.

LIVE FROGS & TURTLES
from
Wisconsin's oldest & largest frog dealer.
E. G. HOFFMAN & SON
P. O. Box 815 - Oshkosh, Wis.

BACK NUMBERS
Most issues of the American Biology Teacher, except those of 1938–39 and 1939–40, are available.
For information write
JOHN P. HARROLD,
110 East Hines St.,
Midland, Mich.

the measures established to protect them form interesting reading.

These Slum Landlords Got Smart by Sidney Shallet, *Sat. Ev. Post*, Jan. 31, 1953, pp. 24–25 & 62–64.

Want an excellent picture of slum conditions? How two Eastern cities are rehabilitating some of their blighted areas may stimulate some students to get busy in their own cities.

How We Saved the Big Trees by Horace M. Albright with Frank J. Taylor, *Sat. Ev. Post*, Feb. 7, 1953, pp. 30–31 & 107–108.

An ex-boss of our National Parks tells how redwoods, especially those of the high Sierras, were saved to be enjoyed by posterity. The color picture is well worth a place in your files.

How Much Pain Can You Stand by John Lear, *Colliers*, Feb. 21, 1953, pp. 66–68.

Pain is a useful warning. Some people are more sensitive to it than others, but you can stand most any pain if you make up your mind you can take it.

Man's Survival in Space: Picking the Men, *Colliers*, Feb. 28, 1953, pp. 42–48.

Who will fly the space planes? The hazards of such operations, just what forces man's body and mind can stand, and the picking of suitable men for the jobs are coldly scientific problems. The research going on to make wise selections makes interesting reading.

Eat a Bigger Breakfast and Be Thin by Fredrick J. Stare, M.D., and Julia A. Shea, M.S., *Colliers*, Feb. 28, 1953, pp. 52–55.

A substantial breakfast with a high protein content prevents mid-morning hunger and the eating of high calorie snacks between meals. Some interesting menus are included.

How to Enjoy Life with Your Dog by Alfred Frank, *Woman's Home Companion*, Feb. 1953, pp. 4–6.

Whether your dog makes you joyful or miserable depends upon yourself. A noted dog trainer gives good advice about choosing and training your dog.

You Can Save Your Child's Life by Albert Q. Maisel, *Woman's Home Companion*, Feb. 1953, pp. 28–29 & 97 & 104–108.

An analysis of why some children have more accidents than others do and what can be done to reduce this greatest threat to a child's life.